46. *Notes on a Fossil Shark's Tooth Found in the Daitô Limestone of Kita-Daitô-Zima, Borodino Islands.*[1]

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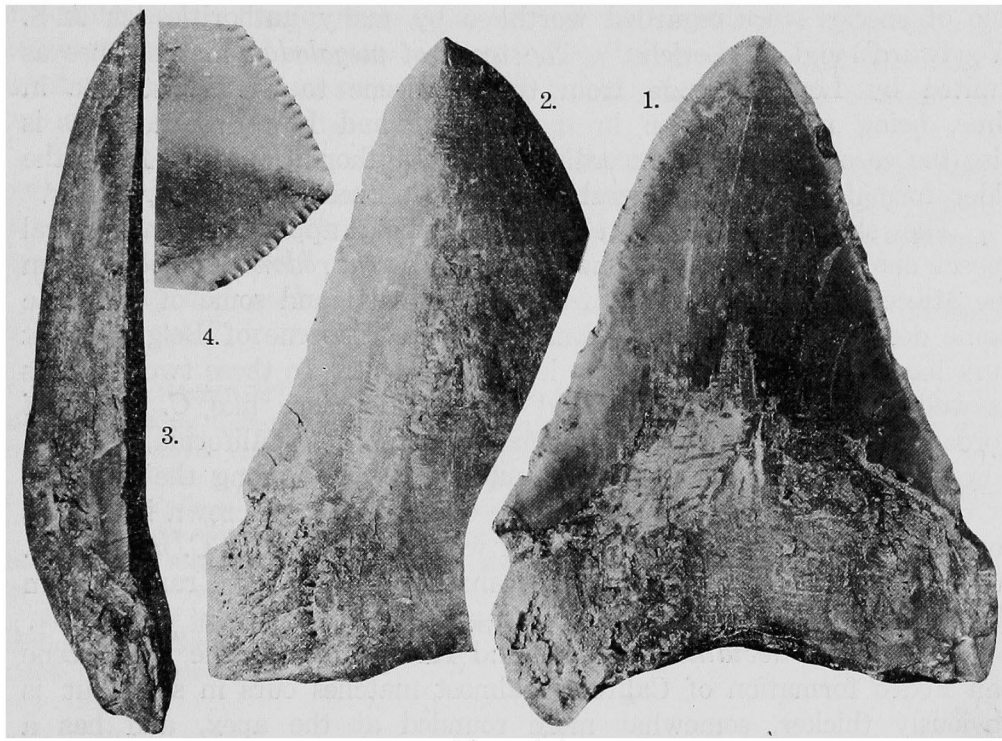
In this article is reported an unexpected discovery of a large shark's tooth from the Daitô limestone[2] of Kita-Daitô-zima, Borodino Islands. It was collected last year by Mr. F. Yamanari from a coral-line limestone of the limestone complex exposed on the north-eastern coast of the island. It is an anterior tooth from a right lower jaw and is similar in general aspect to some of the teeth of the well known, almost cosmopolitan species, *Carcharodon megalodon* Agassiz.

Carcharodon megalodon yamanarii, nov. subsp.



Figs. 1-4.

1, Outer surface; 2, inner surface; 3, anterior view. 3/4
4, apical part, outer surface. 9/4

The Holotype is stored in the Institute of Geology and Palaeontology, Tôhoku Imperial University; Reg. No. 56624.

Tooth large, triangular, 140 mm. high and 105 mm. wide along the root, broken at both ends; rather thin, hardly exceeding 24 mm.

1) Geological Studies of Daitô-zima (Borodino Islands) by the Institute of Geology and Palaeontology, Tôhoku Imperial University. Contribution No. 3. A very brief geological account of the island is given in the Contribution No. 1, Proc. **10** (1934), 361.

2) R. Aoki: Geological and Morphorogical Studies of Kita- and Minami- Daitô-zima (abstract in Japanese). Journ. Geol. Soc. Tokyo, XLI (1934), p. 341.

at the central part of crown; almost equilateral. Crown as high as the width of its base; anterior and posterior border about 120 mm. and 110 mm. long respectively, both nearly straight or somewhat convex above and slightly concave below; apex bluntly pointed, median, turned somewhat backward; outer surface even, nearly flat or but slightly concave as a whole, though gently elevated along the median line, otherwise lacking radial folds; inner surface broadly elevated; serrations minute, very numerous, estimated number being 168 along the anterior border and 145 along the posterior. Root rather narrow, extending as high as one-third the median height of tooth on outer surface; basal curvature relatively weak. Probably lacking basal auricles.

Remarks: Shark's teeth usually assigned to *Carcharodon megalodon* Agassiz are very variable not only in size and form, but also in the size of serrations along the anterior and posterior borders; various species were separated from it on these features, but such discrimination of species were regarded worthless by many authorities as A. S. Woodward[1] and M. Leriche.[2] The teeth of *megalodon* in the sense as limited by Leriche range from the Oligocene to the Pleistocene in time, being most common in the Miocene and Lower Pliocene, as is also the case in Japan. According to this author the teeth from the older formations are in general smaller than those from the younger.

The shark's tooth from Kita-Daitô-zima approaches in general aspect one described by F. Chapman[3] as *Carcharodon megalodon* from the Miocene Oamaru formation of New Zealand and some of the same name described by Leriche[4] from the Lower Pliocene of Belgium, but ours has a thinner crown and a less lunate root. In these two features as well as in the bluntly pointed apex, it is more like *C. branneri* Jordan from the Pliocene Purisima formation of California,[5] which, however, is smaller and bears less numerous serrae along the borders; in this species, as well as in ours, the outer surface of crown is slightly concave lacking the median elevation which characterizes *C. megalodon*. According to D. S. Jordan and H. Hannibal, *C. branneri* ranges from the Miocene to the Pleistocene.

Carchardon leviathan[6] Jordan and Hannibal from the Pleistocene San Pedro formation of California almost matches ours in size, but is obviously thicker, somewhat more rounded at the apex, and has a larger, thicker, more lunate root; in other words, ours is more like

1) A. S. Woodward: Catalogue of the Fossil Fishes in the British Museum, I (1889), p. 415.

2) M. Leriche: Les Poissons Néogènes de la Belgique. Mém. Mus. Roy. d'Hist. Nat. Belg., 32, (1926), p. 412. Les Poissons de la Molasse suisse. Mém. Soc. Pal. Suisse, XLVII, (1927), p. 78.

3) F. Chapman: Descriptions and Revisions of the Cretaceous and Tertiary Fish-Remains of New Zealand. N. Z. Geol. Surv. Pal. Bull., 7 (1918), p. 19.

4) M. Leriche: 1926, loc. cit., p. 412, Pl. XXXV, Fig. 1; XXXVI, 1.

5) D. S. Jordan: The Fossil Fishes of California with Supplementary Notes on Other Species of Extinct Fishes. Univ. Calif. Publ., Bull. Dep. Geol., V (1907), p. 116. D. S. Jordan and H. Hannibal: Fossil Sharks and Rays of the Pacific Slope of North America. Bull. S. Calif. Acad. Sci., XXII, (1923), Pt. 2, p. 53.

6) D. S. Jordan and H. Hannibal: Op. cit., p. 55.

C. branneri than *C. leviathan*, except for fine serration of borders. Leriche who revised *C. megalodon*, included *C. leviathan* in it.

Several teeth of "*C. megalodon*" from the Red Clay of the South Pacific were figured by J. Murray and A. F. Bernard in their standard work "Deep Sea Deposits, 1891," and one of them (Pl. V, Fig. 1) which is most similar to ours preserves the crown only which is acute at the apex and has finely serrated borders. It is to our great regret that we have no further information about these teeth, especially because what seems to be the same specimen referred to above is differently figured by Murray and J. Hjort in "The Depth of Ocean, 1912," (text-figure 126).

A medium sized specimen of "*C. megalodon*" from the Fiji soapstone was once photographed by W. C. Mansfield,[1] and this is also very finely serrated along the borders; unfortunately no further details of it are given.

Lately W. Weiler[2] distinguished *C. premegalodon* from *C. megalodon*, including in the former Palaeogene forms with relatively thin crown, acute at apex and coarsely serrated along borders; the former somewhat reminds us of ours in its crown being relatively thin though the two are different in other features.[3]

The specimen from the Daitô limestone now at our disposal may perhaps be safely included in *Carcharodon megalodon* in a wide sense, but exhibits certain difference from its typical examples as to warrant subspecific separation.[4]

Locality and geological age: Kita-Daitô-zima, northeastern coast; latest Pliocene ? or more probably Pleistocene.

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1) W. C. Mansfield: Fossils from Quarries near Suva, Viti Levu, Fiji Islands and from Vavao, Tonga Islands, with Annotated Bibliography of the Geology of the Fiji Islands. Carn. Inst. Wash. Publ. 344, (1926), p. 93.

2) W. Weiler: Ueber *Carcharodon premegalodon* nov. sp. aus den Alttertiär. Notizb. Ver. Erdk. u. Hess. Geol. Landesanst. z. Darmstadt, V, 10 (1927), p. 106.

3) We have also examined several specimens from the Neogene of Japan previously assigned to *C. megalodon*; most of them are provided with rather coarse serrae along the borders.

4) The new subspecific name is dedicated to Mr. F. Yamanari in recognition of his helpful coöperation to the geological study of Kita-Daitô-zima by our Institute which is now in progress.